

What is claimed is:

1. a data processing system comprising:

5 a plurality of chain managers for performing control of a data input and/or data output service, the data input and the data output service handling data associating with one or more chain objects and having a predefined file format and/or data type;

10 a chain directory for storing correspondence data and performing an executable service retrieval process, the correspondence data storing correspondence relations among identifiers (ID) set on the chain managers, identifiers (ID) of chain objects associating with the chain managers, data input and/or data output services associated with the chain objects, and file formats and/or data types that can be used in the data input and/or data output services, the executable service retrieval process being performed by matching of the file formats and/or data types and matching of the data input and the data output services; and

20 a root chain manager for acquiring one chain object ID and performing a query process to the chain directory, the query process inquiring a chain object that uses the data output or data input service having the same file format and/or data type as that of the data input or data output service associating with the chain object with the acquired ID;

25 wherein the chain manager ID and the chain object ID are identifiers that are defined in address spaces different from each other.

30 2. The data processing system according to claim 1, wherein: the root chain manager is configured to generate a service

query packet to perform the query process to the chain directory; and

the chain directory is configured to generate a chain list that records packet reception time information of the service query packet received from the root chain manager and ID information stored in the service query packet, perform an executable service retrieval process for searching an service that is executable among two chain objects that can be combined based on the IDs recorded in the chain list, and generate a reply to the service query packet based on a result of the executable service retrieval process, the executable service retrieval process being performed if another service query packet storing a different chain object ID is received from the same root chain manager within a predetermined threshold time.

3. The data processing system according to claim 1, wherein: the chain manager ID is an ID that is applicable as a communication address.

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4. The data processing system according to claim 1, wherein: the root chain manager is configured to control the service execution by circulating a chain token among the chain managers corresponding to the chain objects participating in the service based on the reply to the service query packet to the chain directory.

5. The data processing system according to claim 1, wherein: the root chain manager is configured to control the service execution by circulating a first and a second chain tokens among the chain managers corresponding to the chain

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objects participating in the service, the first chain token being for acquiring program information necessary for performing the service and the second chain token being for requesting start of the program corresponding to the service execution process.

6. The data processing system according to claim 1, wherein:
the chain manager is configured to: store an ID of the chain object that is managed by the present chain manager and service profile information as executable service information; performs an ID notification process for the ID of the chain object to be managed based on the service profile information in response to the request of an ID acquisition process from the root chain manager; and performs a data storage process and a program triggering process, the data storage process being performed for a received chain token based on the service profile information in response to the received chain token from the root chain manager, and the program triggering process being performed based on the received chain token.

7. An information processing apparatus serving as a chain manager arranged so as to correspond to each of a plurality of chain objects, the chain object being arranged within a service chain that is included in a data processing system, the information processing apparatus comprising:

memory means for storing an ID set on the chain object, and service profile information as executable service information; and

control means for performing a data storage process for a received chain token and a program triggering process based

on the received chain token, based on the service profile information in response to the chain token received from a root chain manager arranged within the service chain.

- 5 8. The information processing apparatus according to claim 7, wherein:

the control means is configured to perform a process for storing program information, which is required for performing a service stored in the service profile information,
10 in a first chain token received from the root chain manager for acquiring the program information required for performing the service.

9. The information processing apparatus according to claim 15 7, wherein:

the control means is configured to acquire program information necessary for performing a service stored in a second chain token in response to reception of the second chain token, which is received from the root chain manager
20 for requesting start of a program corresponding to a service execution process, and perform a program execution process based on the acquired program information.

10. An information processing apparatus serving as a root
25 chain manager for performing control of data processing service involving a plurality of chain objects, the chain objects being arranged in a service chain that is included in a data processing system, the information processing apparatus comprising:

30 control means for performing an ID acquisition process for the chain objects; generating a service query packet for

inquiring an executable data processing service to which the chain object with the acquired ID is applied; transmitting the service query packet to a chain directory that has service information; and circulating a chain token among chain managers arranged so as to correspond to chain objects participating in the service based on a reply to the query packet; thereby performing control of service execution.

11. The information processing apparatus according to claim 10, wherein:

the information processing apparatus is configured to perform a process of circulating a first and a second chain tokens among the chain managers corresponding to the chain objects participating in the service, the first chain token being for acquiring program information necessary for performing the service, the second chain token being for requesting start of a program corresponding to a service execution process.

12. An information processing apparatus serving as a chain directory for performing an information providing process as to a data processing service involving a plurality of chain objects arranged in a service chain that is included in a data processing system, the information processing apparatus comprising:

a database for storing service information executable by each chain object in association with an ID of the chain object; and

control means for performing a retrieval process on the database that stores the service information in response to a service query packet storing a plurality of chain object

IDs based on the IDs, and generating a service query reply packet that stores executable service information acquired as a result of the retrieval process.

5 13. The information processing apparatus according to claim 12, wherein:

the information processing apparatus is configured to have information, as the service information, which indicates association of an ID of each chain object, service information
10 executable by each of the chain objects, and address information of the chain manager arranged on the chain object; and to search the service information that corresponds to the chain object IDs stored in the service query packet based on the service information in response to reception of the
15 service query packet, generate a service query reply packet storing the searched service information, and transmit the service query reply packet to the root chain manager.

14. The information processing apparatus according to claim 20 12, wherein:

the service information stored in the database includes a service type and a data format that can be processed, the service type indicating whether a service executable by each of the chain objects is a data input mode or a data output
25 mode; and

the control means is configured to perform a matching process for searching a combination of the same data formats that allow a data input and a data output among the service information corresponding to the chain object IDs stored in
30 the service query packet in response to the received service query packet, and generate a reply to the service query packet,

the reply including the matched service as an executable data processing service.

15. The information processing apparatus according to claim
5 12, wherein:

the control means is configured to generate a chain list recording packet reception time information in response to reception of the service query packet received and ID information stored in the service query packet, perform an
10 executable service retrieval process for searching an service that is executable among two chain objects that can be combined based on the IDs recorded in the chain list, and generate a reply to the service query packet based on a result of the executable service retrieval process, the executable service
15 retrieval process being performed if another service query packet storing a different chain object ID is received from the same root chain manager within a predetermined threshold time.

20 16. A data processing method for a service chain including a plurality of chain objects, the each chain object being given a unique ID, the data processing method comprising:

an ID acquiring step for acquiring an ID of the chain object;

25 a query execution step for transmitting a service query packet storing the ID acquired by the ID acquiring step to a chain directory that has service information;

a query reply step for searching service information corresponding to the chain object ID stored in the service
30 query packet based on the chain object IDs in the service query packet, performing a retrieval process to search an

executable service involving chain objects by performing a matching process for searching a combination of the same data formats allowing a data input and a data output, generating a service query reply packet storing service information as the search result, and replying to a sender of the query;
5 and

a control step for performing control of service execution by circulating a chain token among chain managers corresponding to the chain objects participating in the service based on the information stored in the service query
10 reply packet.

17. The information processing method according to claim 16, wherein:

15 the control step includes a process step for circulating a first and a second chain tokens among the chain managers corresponding to the chain objects participating in the service, the first chain token being for acquiring program information necessary for performing the service, the second
20 chain token being for requesting start of the program corresponding to the service execution process.

18. The information processing method according to claim 16, wherein:

25 the control step includes a step for causing the chain manager to store information necessary for performing a program corresponding to the data processing service in the received chain token.

30 19. The information processing method according to claim 16, wherein:

the control step includes a step for causing the chain manager to perform a program triggering process based on the received chain token.

5 20. The information processing method according to claim 16, wherein:

the query reply step includes a step for generating a chain list recording a reception time information of the service query packet and ID information stored in the service query packet, and

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a step for performing executable service retrieval process for searching an service that is executable among two chain objects that can be combined based on the IDs recorded in the chain list, and generating a reply to the service query packet based on a result of the executable service retrieval process, the executable service retrieval process being performed if another service query packet storing a different chain object ID is received from the same root chain manager within a predetermined threshold time.

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21. A data processing method performed by a chain manager arranged so as to correspond to each of a plurality of chain objects that are included in a service chain, the chain object being given a unique ID, the data processing method comprising:

25 a memory step for storing an ID set on the chain object and service profile information as executable service information; and

a control step for performing a data storage process to a received chain token based on the service profile information in response to the chain token received from the root chain manager, and a program triggering process based

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on the received chain token.

22. The information processing method according to claim 21, wherein:

5 the control step includes a process step for storing program information, which is necessary for performing a service stored in the service profile information, to a first chain token received from the root chain manager for acquiring the program information necessary for performing the service.

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23. The information processing method according to claim 21, wherein:

 the control step includes a step for acquiring program information necessary for performing a service, which is
15 stored in a second chain token received from the root chain manager for requesting start of a program corresponding to a service execution process, and performing a program execution process based on the acquired information, in response to the reception of the second chain token.

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24. A data processing control method for a data processing service involving a plurality of chain objects that are included in a service chain, each chain object being given a unique ID, the data processing control method comprising:

25 a step for performing an ID acquisition process for the chain object;

 a step for generating a service query packet regarding an executable data processing service involving a chain object having the acquired ID, and transmitting it to a chain directory
30 that has service information; and

 a control step for performing control of the service

execution by circulating a chain token among chain managers arranged so as to correspond to the chain objects participating in the service based on a reply to the service query packet.

5 25. The information processing method according to claim 24, wherein:

the control step includes a process step for circulating a first and a second chain tokens among the chain managers corresponding to the chain objects participating in the
10 service, the first chain token being for acquiring program information necessary for performing the service, the second chain token being for requesting start of the program corresponding to the service execution process.

15 26. An information provision processing method for a data processing service involving a plurality of chain objects arranged in a service chain that is included in a data processing system, the information provision processing method comprising:

20 a step for receiving a service query packet storing a plurality of chain object IDs;

a search step for performing a retrieval process in a database based on the IDs stored in the service query packet, wherein the database stores service information executable
25 by each chain object in association with the chain object IDs;

a step for generating a service query reply packet storing executable service information acquired as a result of the retrieval process; and

30 a step for transmitting the service query reply packet.

27. The information processing method according to claim 26, wherein:

the service information stored in the database includes a service type and a data format that can be processed, the service type indicating whether a service executable by each of the chain objects is a data input mode or a data output mode; and

the search step includes steps for performing a matching process for searching a combination of the same data formats that allow a data input and a data output among the service information corresponding to the chain object IDs stored in the service query packet, and extracting a matched services as an executable data processing service.

28. The information processing method according to claim 26, further comprising:

process steps for generating a chain list recording packet reception time information in response to reception of the service query packet received and ID information stored in the service query packet; performing an executable service retrieval process for searching an service that is executable among three or more chain objects, that include the ID recorded in the chain list; and generating a reply to the service query packet based on a result of the executable service retrieval process, the executable service retrieval process being performed if another service query packet storing a different chain object ID is received from the same root chain manager within a predetermined threshold time.

29. A computer program for performing a data process performed by a chain manager arranged so as to correspond

to each of a plurality of chain objects that are included in a service chain, the chain object being given a unique ID, the computer program comprising:

5 a memory step for storing an ID set on the chain object and service profile information as executable service information; and

10 a control step for performing a data storage process to a received chain token based on the service profile information in response to the chain token received from the root chain manager, and a program triggering process based on a received chain token.

30. A computer program for performing a data processing control process for a data processing service involving a plurality of chain objects that are included in a service chain, each chain object being given a unique ID, the computer program comprising:

a step for performing an ID acquisition process for the chain object;

20 a step for generating a service query packet regarding an executable data processing service involving a chain object having the acquired ID, and transmitting it to a chain directory that has service information; and

25 a control step for performing control of the service execution by circulating a chain token among chain managers arranged so as to correspond to the chain objects participating in the service based on a reply to the service query packet.

31. A computer program for performing an information providing process for a data processing service involving a plurality of chain objects arranged in a service chain that

is included in a data processing system, the computer program comprising:

a step for receiving a service query packet storing a plurality of chain object IDs;

- 5 a step for searching service information corresponding to a chain object ID stored in the service query packet based on the chain object IDs in the service query packet, performing a retrieval process to search an executable service involving chain objects by performing a matching process for searching
- 10 a combination of the same data formats allowing a data input and a data output, and generating a service query reply packet storing the service information as the search result; and
- a step for transmitting the service query reply packet.